case carbon is not assimilated in so large a proportion to the nitrogen taken up.

Next, it is to be observed that the wheat-plants manured with ammonium-salts alone show a much higher percentage of nitrogen than those manured with the same amount of ammonium-salts but with mineral manure in addition. The high proportion of chlorophyll again goes with the high nitrogen percentage; but the last column of the table shows that, with the ammonium-salts without mineral manure, with the high percentage of nitrogen, and the high proportion of chlorophyll, in the dry substance of the green produce, there is eventually a very much less assimilation of carbon. The result is exactly similar in the case of barley; the plants manured with ammonium-salts alone showing the higher percentage of nitrogen, and the higher proportion of chlorophyll, but eventually a much lower assimilation of carbon.

It is evident that the chlorophyll formation has a close connection with the amount of nitrogen assimilated, but that the carbon assimilation is not in proportion to the chlorophyll formed, if there be a relative deficiency of the necessary mineral constituents available. No doubt there has been as much, or more, of both nitrogen assimilated and chlorophyll formed, over a given area, where the mineral as well as the nitrogenous manure had been applied, the lower proportion of both in the dry matter being due to the greater assimilation of carbon, and consequently greater formation of non-nitrogenous substances.

It is of interest to observe that these results of experiments in the field are perfectly consistent with those obtained by vegetable physiologists in the laboratory; they having found that the presence of certain mineral or ash constituents, and especially that of potassium, is essential for the assimilation of carbon, no starch being formed in the grains of chlorophyll without the aid of that substance. Sachs says:—"Potassium is as essential for the assimilating activity of chlorophyll as iron for its production."

Relation between Nitrogen Accumulation, Chlorophyll Formation, and Carbon Assimilation.

The figures in parentheses represent determinations in the not fully dried substance.

	Nitrogen per cent. in dry substance.	Relative amounts of Chloro-phyll.	Carbon assimilated per acre per annum.	
			Actual.	Difference.
			lbs.	lbs.
HAY—				
Gramineæ	1·190	0·77		
Leguminosæ	2·478	2·40		
WHEAT—				
Ammonium-salts only	(1·227)	2·00	1,398	−824
Ammonium-salts and mineral manure ...	(0·566)	1·00	2,222	
BARLEY—				
Ammonium-salts only	(1·474)	3·20	1,403	−685
Ammonium-salts and mineral manure ...	(0·792)	1·46	2,088	

CARTOGRAPHICAL WORK IN RUSSIA IN 1884[1]

THE chief surveys in European Russia are directed towards mapping South Finland, the western frontier on the Duna and Dnieper, and the Government of Taurida. The surveys are made on a scale of 1750 feet to the inch, and the inequalities of soil are represented by horizontal lines received from accurate levellings. Since 1870 about 44,000 square miles have been thus mapped, and, in 1884, 6850 square miles were added to the above, the newly-annexed part of Bessarabia included. The geodetical triangulation for this survey was continued in Poland and Grodno. The work for an orographical map of Russia, which must be based on accurate levellings, has been busily continued since 1881, as also telegraphic determinations of longitudes in Poland.

[1] *Izvestia* of the Russian Geographical Society, September, 1885.

Instead of the former map of West and Middle Russia, on 150 sheets, on the scale of 3 versts (2 miles) to an inch, the Topographical Department is now preparing a new map on a larger scale (2 versts to an inch), which will be printed on a new method, by helio-engraving, with level-lines in a separate colour. Many preliminary essays having been made, this method has been definitively adopted. The map of Russia (10 versts to an inch) has been completely revised by General Strelbitzky; and the map of the Caucasus, on the same scale, was completed in 1884. The northern and north-eastern sheets of the map of European Russia will be completely revised in accordance with new surveys.

The map of the Asiatic dominions of the Empire, with the neighbouring regions (100 versts to an inch), is completed, and is printed in colours. That of the eastern part of the Balkan peninsula is prepared on two different scales (5 and 3 versts to the inch), and on both maps the inequalities of the soil are represented by horizontal lines. The middle parts, including the Balkan ridge, were ready to print. Helio-engraving had also been resorted to, but it required considerable retouching by the engraver.

Leaving aside the purely military maps of Middle Europe and the statistical maps of the St. Petersburg military district, the following maps, published in 1884, are especially worthy of notice:—The region of the Cossacks of the Ural (10 versts to an inch); the Island of Sakhalin (40 versts); North-Western Mongolia (50 versts), including all the rich materials collected by the expeditions of MM. Potanin, Rafailoff, Orloff, Prjevalsky, Pevtsoff, and several others; Afghanistan (50 versts), according to the surveys and information of M. Lessar; the south-western Turkoman region, by the same (20 versts); the surveys of M. Kosyakoff in Karategin and Darvaz (15 versts); the survey from Staro-Tsurukhaitu to Aigun, on the Amur (25 versts); a map of China proper, by M. Matusovsky (100 versts); the plans of Odessa, Nikolaieff, Ekaterinoslav, Bendery, and Elizabethgrad, as also of Plevna and Lovtcha; the neighbourhoods of Kazan and of Novogeorgievsk, and many others.

On the Caucasus, as soon as the triangulation of the region was terminated some fifteen years since, a series of surveys, on scales of 1400, 1750, and 3500 feet to an inch, were undertaken. Large parts of Transcaucasia were thus mapped. Since 1881 the work has been prosecuted in the central parts of the great Caucasus ridge, in Daghestan, and in the Transcaspian region; about 30,000 square miles were thus surveyed. In 1884 the chief surveys were made in the teritory of Merv, along the Murghab; and on the routes between Kizil-arvat, Petro-alexandrovsk, Khiva, and Merv. The drawing and engraving of the great map of the Caucasus with the neighbouring parts of Persia and Turkey, as also of that of the Transcaspian region, both on a scale of 5 versts to the inch, have been prosecuted.

In Turkestan the chief attention has been directed towards the survey of the former khanate of Kokan, now the province of Ferghana, the work meeting with great difficulties owing to the hilly character of the region and its unhealthy climate. Reconnoitring has been prosecuted in the vassal khanates of Bokhara, west of the Pamir, by a topographer who accompanied Dr. Regel.

The mapping of the town of Tashkend, which covers as much as thirty-five square miles, and where trigonometrical measurements meet with great difficulties on account of refraction and the want of wood for the triangulation-pyramids, a system known under the name of *Polygonale Züge*, and which has been greatly extended of late in Germany, has been resorted to. The horizontal angles were measured by a little universal instrument, and the distances by a ribbon, with the help of the eclimetre. The results obtained were very satisfactory. Several new sheets of the 10 versts map were printed, as also a map of the neighbourhood of Tashkend.

In the Omsk military district, detailed surveys, based on a geodetical net, have been prosecuted since 1870 to the south-west of the Irtish River, between its sources and Pavlodar. In 1883 and 1884 large spaces in the region between Omsk, Pavlodar, Petropaulovsk, and Kokchetav were mapped, and a series of latitudes and longitudes were determined.

In Eastern Siberia the Government of Irkutsk is now surveyed on a scale of one verst to the inch, the trigonometrical net having been completed in 1882. The upper parts of the Vition and Barguzin were reconnoitred, and the trigonometrical net extended in Southern Transbaikalia. On the Pacific coast, the region east of the Suifun River, and on the Chinese frontier, has been surveyed.

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The following maps, published by the Military Commissariat, deserves also a short notice:—A map of European Russia, showing for each government the surplus, or the want of, rye raised within the government, as also its price, which map leads to very interesting geographical conclusions; a map showing the average crops proportionately to the population; and a map of the sheep-breeding in Russia.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The first award of the Smith's Prizes under the new regulations has been made. They are now given to the Bachelors of Arts who send in the best essays on any subject in Mathematics or Natural Philosophy before the end of the Lent Term in the second year after each Mathematical Tripos. Thus the competitors this year took their degree in the Mathematical Tripos of 1883–84. The Smith's Prizes this year are awarded to two essays declared equal in merit, viz. that of Mr. H. E. G. Gallop, Fellow of Trinity College, Second Wrangler in 1883, 1st Division in Part III., 1884, subject, "The Distribution of Electricity on the Circular Disk and Spherical Bowl"; and that of Mr. R. Lachlan, Fellow of Trinity College, 3rd Wrangler, 1883, 1st Division in Part III., 1884, subject "Systems of Circles." It is further announced that the essay by Mr. C. Chree, Fellow of King's College, on "Elastic Solids," and that of Mr. A. N. Whitehead, Fellow of Trinity College, on the "General Equations of Hydrodynamics," deserved honourable mention.

The Special Board for Medicine have reported in favour of the immediate appointment of a Demonstrator of Pathology, with a stipend of 100*l.* a year, to assist Prof. Roy, who now gives systematic lectures three times a week, conducts a practical course for two hours twice a week, and undertakes the autopsies at Addenbrooke's Hospital.

The Chemical Laboratory Syndicate have recommended the acceptance of Messrs. Bull, Sons, and Co.'s tender (Southampton) for 19,300*l.*

The following appointments to Syndicates and Boards have been made:—

Botanic Garden: Messrs. A. H. Cooke and W. Gardiner.
University Library: Prof. A. Macalister.
Museums and Lecture Rooms: Messrs. E. H. Morgan and R. T. Caldwell.
Local Examinations: Mr. J. W. Hicks.
Observatory: Dr. Routh and Mr. J. Larmor.
University Press: Prof. A. Macalister.
State Medicine: Prof. Latham and Dr. D. McAlister.
Mathematics: Dr. Routh.
Physics and Chemistry: Mr. C. Trotter.
Biology and Geology: Mr. W. Gardiner.

Great opposition has been given to the new proposals as to the additional subjects of the Previous Examination required of candidates for honours. As Mr. Oscar Browning said, "dealing with this subject seemed to cast an evil influence over every one who takes it in hand." The fact is the University, containing strong elements attached to and connected with the Public School system, refuses to boldly grasp the nettle and introduce English, Modern Languages, or Physical Science into its schemes for the Ordinary Preliminary Examination, and finds itself consequently in endless difficulties whenever it touches the question.

IN addition to the practical instruction in Biology (Zoology and Botany), in preparation for the Preliminary Scientific and B.Sc. Examinations at the University of London, which we have already announced as being given at Bedford (Ladies') College, York Place, Baker Street, we are informed that a class in Geology and Physical Geography has now been formed, in accordance with the requirements of the University, and that it will be conducted by Miss Mary Forster.

SOCIETIES AND ACADEMIES

LONDON

Chemical Society, November 5.—Dr. Hugo Müller, F.R.S., President, in the chair.—Mr. Leonard de Koningh was admitted a Fellow of the Society.—The following papers were read:—The influence of silicon on the properties of cast iron, part 2, by Thomas Turner, Assoc. R.S.M.—Modifications of double sulphates, by Spencer Umfreville Pickering, M.A.—The relation of diazobenzene-anilide to amidoazobenzene, by R. J. Friswell and A. Green.—An examination of the phenol constituents of blast-furnace tar obtained by the Alexander and McCosh process at the Gartsherrie Iron Works, part 1, by Watson Smith, J. F. H. Coutts, and H. E. Brothers.—The decomposition of potassium chlorate by heat, by Frank L. Teed, F.C.S. Note on the refractive power of metacinname (metastyrole), by H. G. Madan, M.A., F.C.S.

Zoological Society, November 17.—Prof. W. H. Flower, F.R.S., President, in the chair.—The Secretary exhibited to the meeting two curious Millipedes, believed to be *Spirostreptus annulipes*, which had been sent home from the Cape by Mr. Fisk for the Insect House.—An extract was read from a letter addressed to the Secretary by Major S. W. Yerbury, respecting the exact locality of a Chameleon (*Chamæleon calcarifer*) presented to the Society by that gentleman in June, 1885. Major Yerbury had obtained this specimen near Aden.—Mr. Sclater exhibited and made remarks upon two Newts (*Molge vittata*) transmitted to the Society by Dr. E. B. Dickson, of Constantinople, C.M.Z.S., by whom they had been obtained from Brussa, Asia Minor.—Mr. H. E. Dresser exhibited and made remarks on a female specimen of the Kildeer Plover (*Ægialitis vocifera*), killed, in January, 1885, by Mr. Jenkinson on the Scilly Isles; and a young female Desert-Chat (*Saxicola deserti*) obtained near Spurn Head, Lincolnshire, in October, 1885.—Prof. F. Jeffrey Bell exhibited and gave an account of a specimen of a species of *Balanoglossus* obtained by Mr. Spencer at Herm, Channel Islands, being the first recorded instance of the occurrence of this Hemichordate in any part of the British seas.—Mr. F. E. Beddard read the first of a proposed series of notes on the visceral anatomy of birds. The present paper treated of the so-called omentum of birds and its homologies. It was pointed out that this structure, present in many birds, but apparently absent, or only present in rudiment, in a few others, was represented by a structure having similar relations in the Crocodile, but in no other reptile.—Mr. Oldfield Thomas read a description of *Heterocephalus phillipsi*, an extremely remarkable burrowing Rodent from Somali-land, belonging to a genus of which the only other known species was based upon a single specimen obtained by Rüppell's collector in Schoa. Mr. Thomas considered the affinities of this Rodeut to be with *Georychus* and *Bathyergus*.—Mr. Sclater read a paper containing a description of an apparently new species of Tanager of the genus *Calliste*, based on a specimen formerly in the Gould Collection, now in the British Museum. Mr. Sclater proposed to dedicate this bird to its former owner as *Calliste gouldi*.—Mr. Boulenger gave the description of a new frog from Perak, Malacca, which he proposed to name *Megalophrys longipes*.

Physical Society, November 14.—Prof. Guthrie, President, in the chair.—Mr. G. M. Whipple described and demonstrated experimentally the process of testing thermometers at and near the melting-point of mercury, as carried on at Kew. About 20 lbs. of mercury are poured into a wooden bowl and frozen by carbonic-acid-snow and ether; the mercury is stirred with a wooden stirrer, and the snow is added till the experimenter feels, by the resistance to stirring, that the mercury is freezing. The stirring is continued for some time, which causes the mercury to become granular instead of a solid mass. The thermometers are then inserted, together with a standard, and compared. About 100 mercury or 40 spirit thermometers can be thus examined in half an hour, using about 200 gallons of carbonic acid gas compressed sufficiently to form the snow. The bowl, ether, and mercury are cooled first to -10° C. by an ordinary freezing-mixture. The average correction at the melting-point of mercury is now less than 1° F.; when the process was introduced in 1872 it amounted to 5°, but has steadily decreased.—On the electromotive force of certain tin cells, by Mr. E. J. Herroun. Mr. Herroun has examined the electromotive forces of cells in which tin in a solution of its salts was opposed to copper, cadmium, and zinc in solutions of their corresponding salts, the solutions being of equal molecular strengths. The salts used were sulphates, chlorides, and iodides, and the cells were of the ordinary "Daniel" form, with a porous vessel. To prevent the formation of basic salts it was necessary to add a little free acid to the solution of the tin salt, and, to counterbalance the influence of this acid upon the E.M.F. as far as possible, an equal proportion of free acid was added to the other

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